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whole length. The experiments on snails were made by separating the tentacles and closing the end with a clamp, then these were put into a vessel containing moist air and it was noticed that after a time the movements of the tentacles ceased, but if some strong vapor, like that of benzine, was introduced into the vessel the movements would begin again with great activity. From these experiments and others in the same line, the author concludes that it is the sensibility of the segments that is first excited, then this sensation is transferred by contraction, which in its turn agitates mechanically the nerve terminals and is conveyed to the sensorial nerve centers. The first excitation is mechanical, just like that which produces the sensation of touch.

*Further observations on the development of taste organs in man*, Dr. Frederick Tuckerman.—*Journal of Anatomy and Physiology*, Vol. XXIV. p. 130.

In the tongue of the human embryo of the tenth week, the organs were so slightly developed as to be hardly worthy of notice, but in the examination of the tongue of the fœtus of the fourteenth week it was noticed that the upper surface was more or less marked by papillary elevations of the mucus membrane. The different layers of the epithelium were also studied. The striated muscle fibres were clearly to be seen, but the striæ were exceedingly faint. Some papillæ of the circumvallate type, in the early stages of development, were present, and the future position of the trachea was clearly indicated. Lateral gustatory organs could be perceived at the sides of the back of the tongue. But little could be learned of the structure of the bulbs in the circumvallate papillae.

*Ueber das Vorhandsein von Geschmacksempfindung im Kehlkopf*, Dr. P. Michelson.—*Archiv für pathologische Anatomie und Physiologie und für klinische Medicin*. Vol. CXXIII. 389.

The author has studied the special functions of the taste cells of the inner portion of the trachea. He experimented on 25 persons, by putting into the throat upon the end of a bougie concentrated solutions of quinine and of saccharine. Seventeen persons were able to distinguish the bitter taste of the former, three thought it bitterish and the rest were in doubt as to the taste. With the saccharine solution all but three of the twenty-five could recognize the sweet taste. There was one special case in which the bitter could not be detected at all, while the sweet could be readily recognized. Some, in reply to a question as to the locality where the sensation was recognized, said it was where the solution was applied, others that it was in that region, while some simply located it deep in the throat. The electric current was also applied to the same localities, and it was noticed that the application of one pole produced the sensation of an acid taste and the other of an alkaline taste.

*Sur la norme de l'acuité olfactive (olfactie)*, Zwaardemaker.—*Archives Néerlandaises*, XXV. 131.

From the average acuteness of the sense of smell accurately measured in 21 persons with the author's olfactometer, a norm is reached on which is based a system of measuring and recording the acuteness of smell, modeled after that in use by oculists for visual acuteness. The *olfactie* or average *minimum perceptible* of smell is the unit taken for these measurements. The average for a table of proper proportions of these substances and pictures of the olfactometer may be found in the original. When the mixed odors are delivered to the same nostril it might be supposed that they neutralized each other by some chemical

or physical change, but this is out of the question when each nostril receives a single odor, when the phenomenon is no less to be observed. By the adoption of porous earthenware cylinders in his olfactometer, Zwaardemaker is enabled to make tests with any odorous solution of definite dilution and most important of all to make them with chemical substances of known formulæ. It is to be hoped that the author will continue his studies in this interesting and, until his investigations and those of Aronsohn, rather unsuccessfully worked field. The 21 persons (furnishing 34 normal nostrils) is 1.5 degrees on the olfactometer (i. e., they could just perceive the odor furnished by the inside surface of a vulcanized rubber tube of 8 mms. bore when 1.5 cm. were exposed). The figure occurring most frequently, however, was 0.7 degrees; and Zwaardemaker's own *minimum* is 1.0. The figures for the cases examined, as also those for some visual tests made by the author, appear in the original.

*Compensation von Gerüchen mittelst des Doppelriechmessers*, Zwaardemaker.—Fortschritte der Medicin, 1889 Vol. VII. 721.

By use of his simple olfactometer the author has been enabled to verify, amplify and give numerical exactness to the empirical observation of perfumers, physicians and others that certain odors do not blend but neutralize each other. In this way the odor of vulcanized rubber may neutralize the odor of cedar wood, gum benzoin, paraffine wax, balsam tolu, and in turn be neutralized by any one of them if the odors are rightly graded in intensity; if the right proportion is not observed either one or the other prevails.

#### SPACE, TIME.

LIPPS, *Die Raumanschauung und die Augenbewegung*, Zeitschrift für Psych. u. Phys. der Sinnesorgane, 1892 III.

This is mainly a criticism of "eye-movement" theory, from the standpoint taken in other writings of the author. Lipps insists on the distinction between what is really seen and what is inferred, be the "seeing" normal or abnormal. Such optical illusions as the apparent inequality of distances and of line lengths are simply a result of our comparison—a matter of judgment. Eye-movements help us to form our space-consciousness by giving clearness and certainty to perception. Furthermore, if we regard the field of vision as a section of the larger space-world, which we survey by moving our eyes or turning our head, we may say that the position (and change of position) of the visual field is measured by such movements, without admitting that the relative position of points in that field is affected.

We do not *see* distance; we *judge* one object to be more or less remote than another. In this, as in other sense-perceptions, we *believe* that we perceive something, which in reality we do not perceive. The *form* of our visual field is likewise the outcome of judgment. The inference, not of our original, but of our developed space-consciousness, is based on eye-movements, and especially upon convergence-sensations. The original field of vision is no more a hollow sphere than it is a plane; in fact, for monocular vision there is no such thing as a spherical field. The "Blickpunkt," which is supposed to sweep round in immense circles, is an abstraction. The points successively fixated range themselves in circles because of the dome-shape of the visual field—a shape given it by experience, inasmuch as we perceive no difference in those sensations of convergence, which have come to be distance signs, and therefore regard the objects to which they correspond as equally distant from us.

The consciousness that objects are at *different* distances from us tends to correct our perception of their size. Hence, a conflict between per-